Insights from Modeling of the RGGI CO2 Cap and Trade Program

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Motivation

- Market participants have concerns about
  - RGGI modeling assumptions
  - RGGI modeling findings and
  - how modeling affected final policy design including total emissions allocations to sources in New York and other states.
- How does RGGI compare to what's happening in California?
- Proposed NY RGGI rule expected from the NY DEC later this month.

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Outline

- RGGI Background and Status
- Background on IPM Model and Assumptions
  - Focus on electricity sector modeling
- Findings of IPM Modeling
  - Package scenario
  - Sensitivities
- Some thoughts on allowance allocation
- Climate policy in California and RGGI
- Concluding Thoughts

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All models are wrong;
some models are useful.

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RFF and RGGI

- RFF has done some independent modeling of
  - different approaches to allowance allocation under RGGI
  - tailoring allocation rules to meet compensation objectives.
- RFF organized a workshop on designing an allowance auction for purposes of implementing the 25% public benefit allocation.
- RFF is involved in a Maryland Department of Environment sponsored research project to analyze the effects of Maryland joining RGGI

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RGGI Background and Status

- Goal to develop strategy to reduce GHG emissions in region using an emissions cap and trade approach.
- Process began in 2003.
- MA and RI drop out in December 2005.
- Remaining 7 states announce agreement on December 20, 2005.
- Draft model rule released in March 2006.
- Final model rule released in August 2006.
- State implementation required.

Maryland passed a law requiring the state to join RGGI by June 2007.

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Elements of RGGI MOU and Model Rule

- Program to start in 2009; includes all units over 25 MW.
- Stabilize emissions at current levels through 2015.
- Ramp down to 10% below current levels by 2019.
- Banking of allowances is allowed along with use of emission offsets subject to some restrictions.
- State apportionment of CO_2 emission allowances based on historic emissions and other factors.
- States responsible for allocation to sources. Agreed to dedicate **25%** for consumer benefit or strategic energy purposes. (Some states will do more.)

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RGGI Wide Issues Going Forward

- Establish regional organization.
- Facilitate cooperation among states in finalizing rule and in implementation.
- Imports and Leakage Working Group to continue its work.
- Recruit participation of additional states.

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RGGI Issues to be Decided – New York State

- Draft regulation to be proposed this fall by New York DEC. Important decisions include:
  - Rules for initial allowance allocation; (Eliot Spitzer wants to auction 100%.)
  - How public benefits allowances will be used.

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Purpose of RGGI Modeling Exercise

- To estimate the cost of the RGGI emissions caps (CO_2 allowance price)
- To estimate effects of RGGI caps on generators and consumers in individual RGGI states.
- To estimate CO_2 emissions leakage resulting under the policy.
- To analyze the sensitivity of results to parameter uncertainty (fuel prices, coal build restrictions, performance of RPS, broader climate policy).
- To inform deliberations regarding RGGI policy design.

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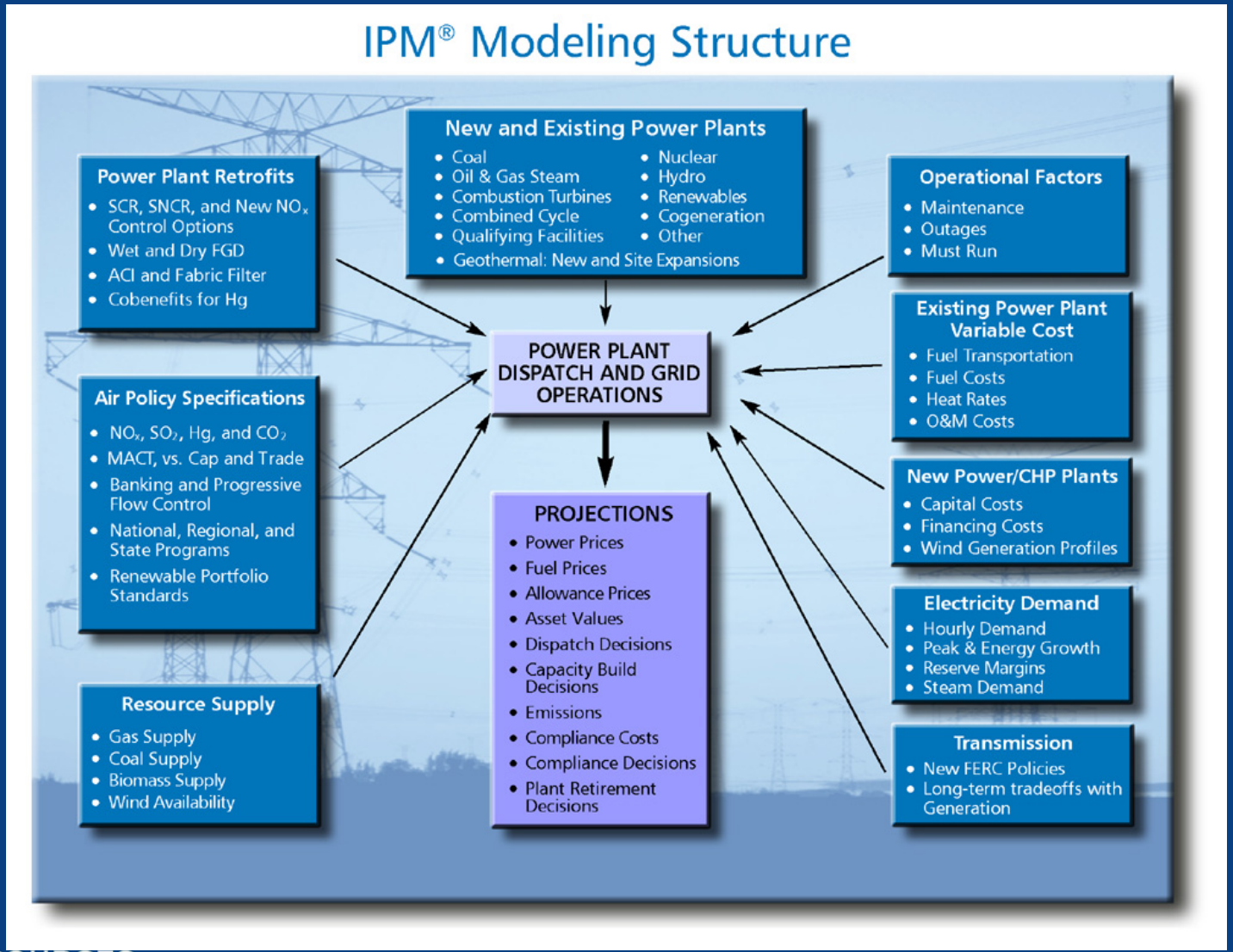
IPM® Analytic Framework



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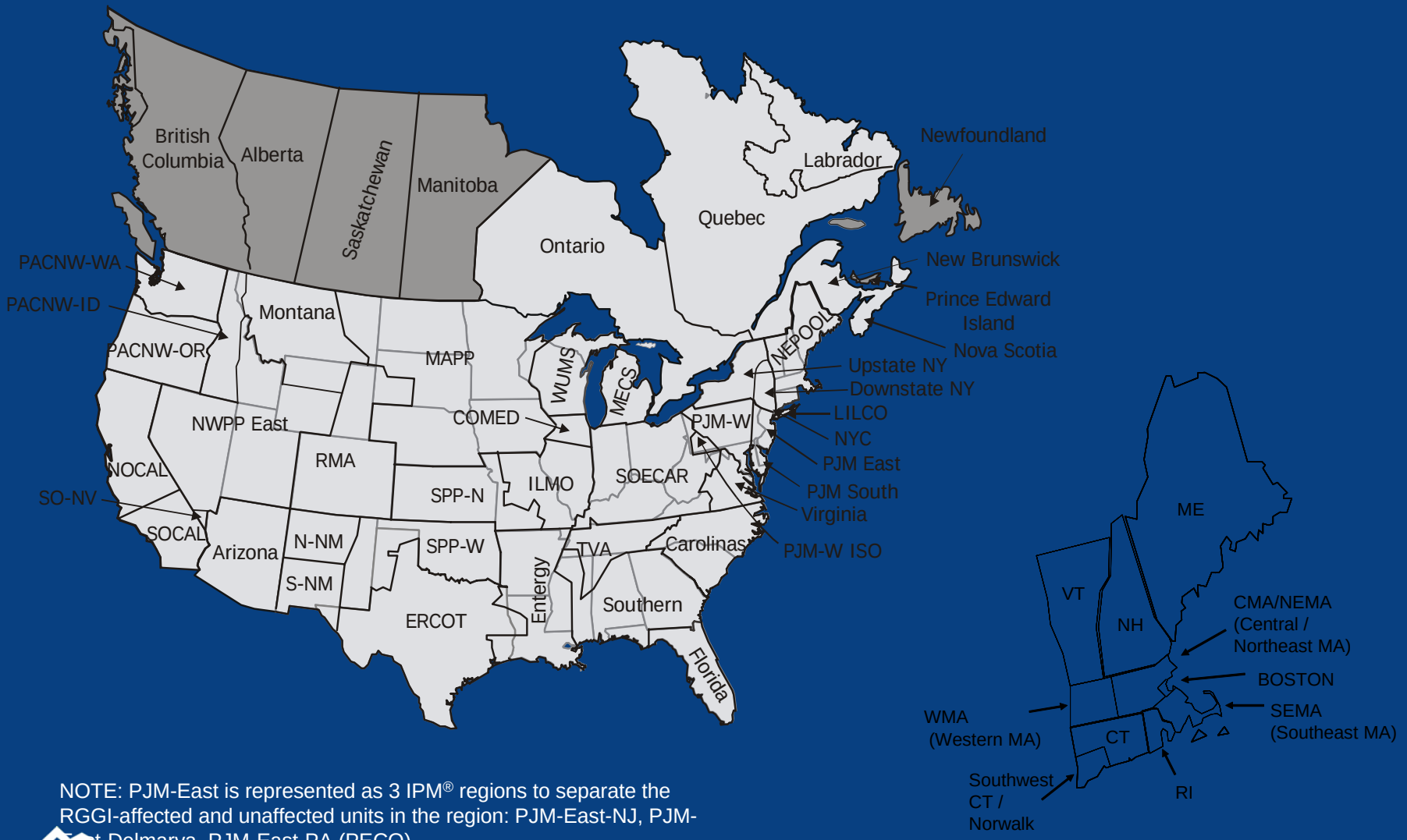
IPM solution Process

- Objective is to find way to meet projected load at lowest cost.
- Modelers create load duration curves for each region and season based on exogenous total demand.
- IPM dispatches generators based on variable cost subject to availability and operating constraints and transmission constraints – least cost dispatch.
- Last unit to be dispatched in time period sets the energy price in region.
- Investment in new generating facilities is endogenous in the model based on expected future profits from energy and capacity sales.
- Uneconomic units will be retired.

IPM® North America



NOTE: PJM-East is represented as 3 IPM® regions to separate the RGGI-affected and unaffected units in the region: PJM-East-NJ, PJM-East-Delmarva, PJM-East-PA (PECO).

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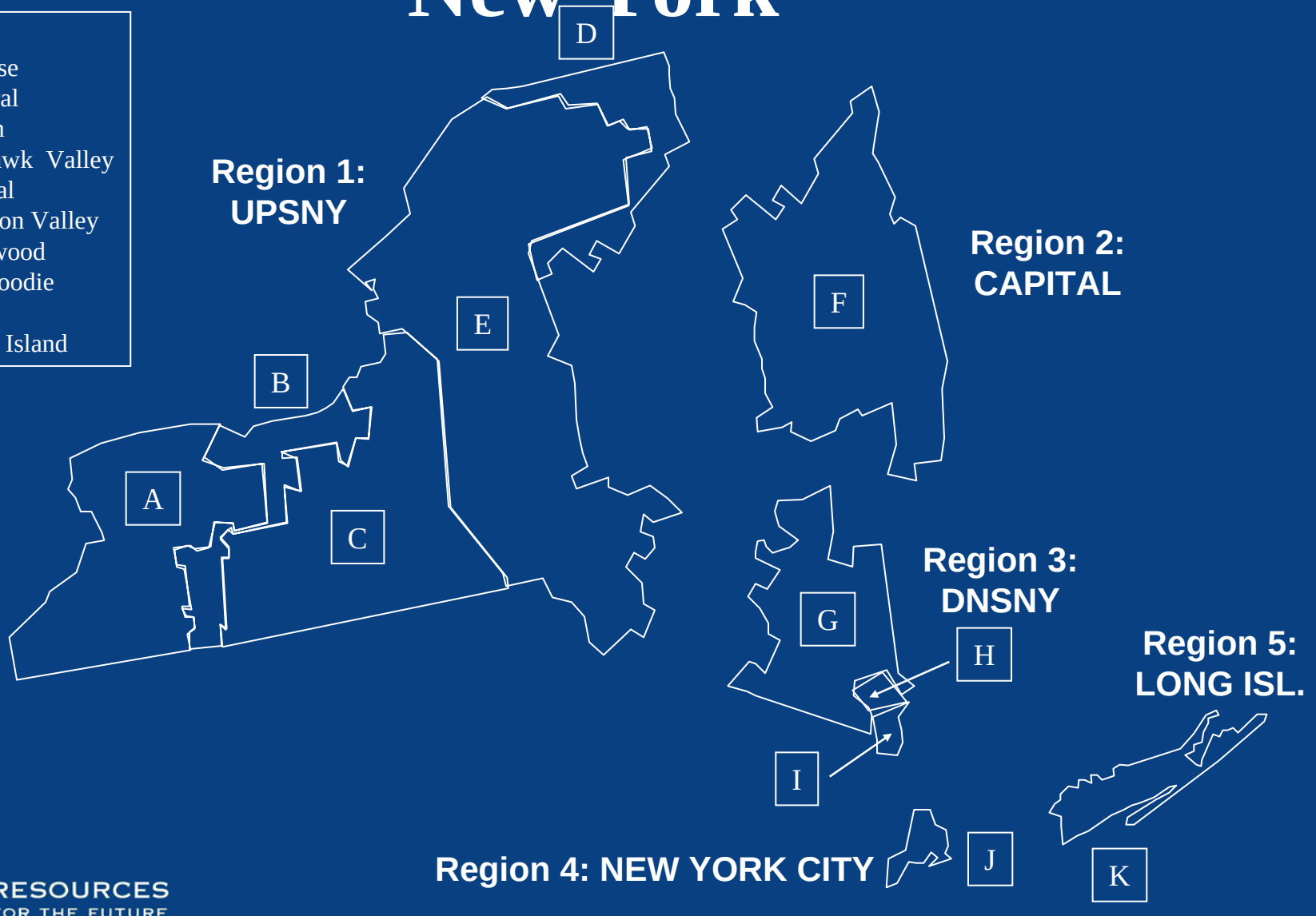
IPM® Regional Breakdown of the New York

A – West
B – Genese
C – Central
D – North
E – Mohawk Valley
F – Capital
G – Hudson Valley
H – Millwood
I – Dunwoodie
J – NYC
K – Long Island



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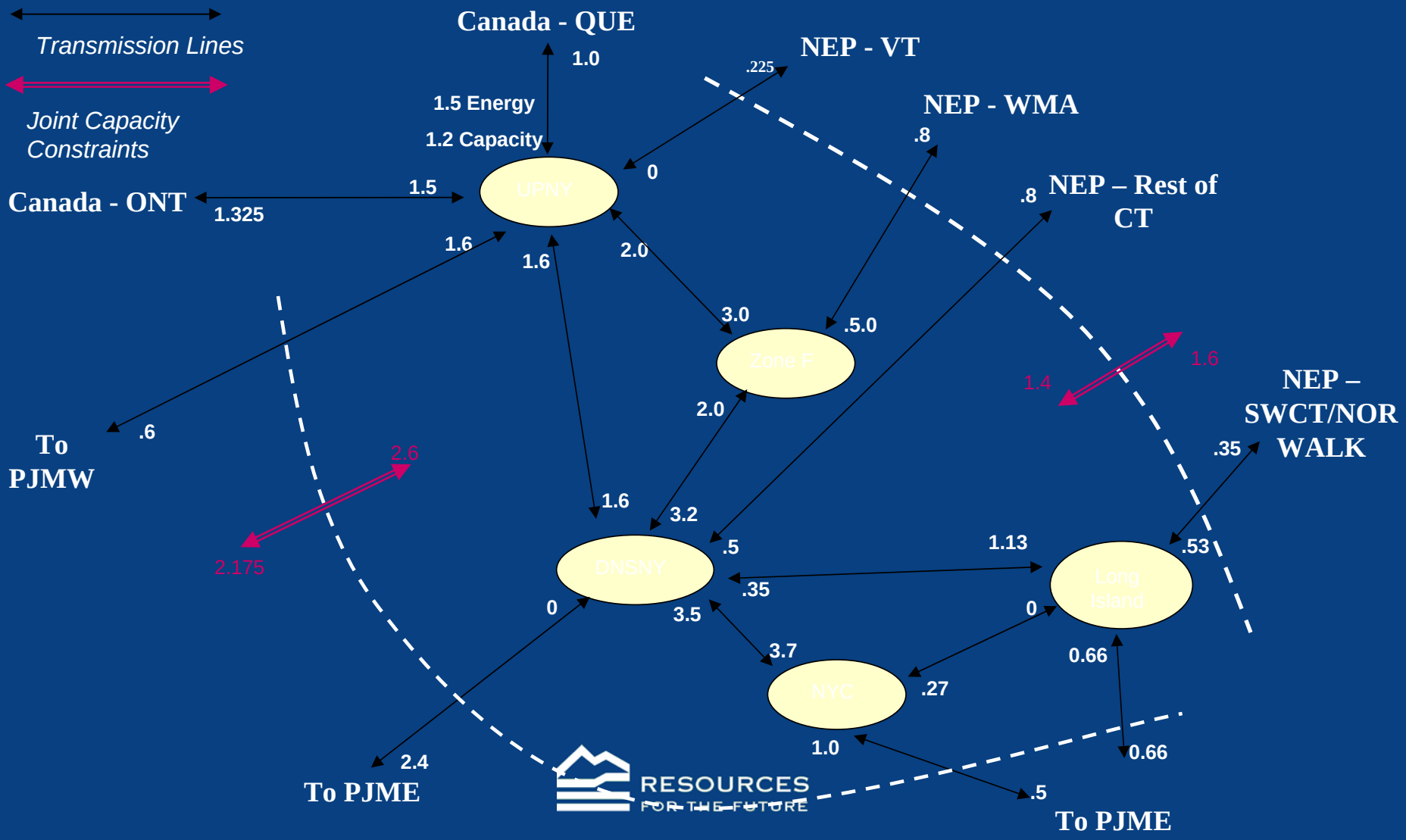
Transmission Capability -- Energy
New York (GW)



Additional Assumptions

- Constraints on operations of oil-fired facilities to accommodate must run considerations.
- Transmission flows constrained in near term to match 5-year average historic levels.
- Capacity markets tailored to match upstate New York.
- Nuclear plants are relicensed by assumption and have opportunity to perform uprates.
- No new coal units allowed to be built.
- Gas price forecasts are mix of EEA (short term) and EIA (long term).

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Scenarios

- Reference Case (without RGGI)
  - Includes federal 3 P policy and state air policies
  - Includes a representation of RPS policies in RGGI states
- Package RGGI Policy Scenario (9-state RGGI)
  - RGGI emissions caps
  - Offsets allowed up to 50% of reductions
  - Continued End-use Efficiency Investment
- Sensitivities
  - High Emissions Case
  - Very High Emissions and low RPS
  - Low Emissions Case
  - Federal and Canadian Climate Policy
  - 8 state RGGI

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Perspective on CO_2 Caps

- RGGI program is about capping and reducing CO_2 emissions.
- Unlike SO_2 or NOx, no economically feasible emissions controls for CO_2 currently.
- Emissions reductions come from
  - Redispatch of existing units
  - More investment in renewables
  - Imports of power (leakage)
  - Reduced demand
- Offsets can also be used for compliance.
- IPM has fixed demand so demand reductions come from efficiency programs only.

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Findings: Package Case

RGGI Region

- Gas generation falls by over 20% while coal falls by roughly 5%, increasing its share.
- Renewables generation declines slightly.
- Net electricity imports to RGGI are 50% higher than reference case in out years.
- CO_2 emissions leakage is roughly 21% of reductions (including offsets) in RGGI region in 2024.
- CO_2 allowance price is always below $3.

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Findings: Package Case

New York

- Total generation for load lower by 3-5% per year.
- Coal generation declines slightly, but coal's share of total generation is higher with RGGI.
- Renewables generation increases by 2% due to policy.
- No additional retirements of capacity in NY from RGGI package.

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Findings: Select Sensitivities

General

- Federal and Canadian policy cases trump RGGI as leakage option is eliminated and yield highest CO_2 price.
- High emissions scenario leads to
  - doubling of imports into RGGI
  - increase in emissions leakage to 34%
  - Allowance price hits CDM offset price of $6.50
- In general, allowance price only rises above $6.50 if offset limit is binding or access to CDM market is limited.
- "No Massachusetts" sensitivity has very little impact on RGGI allowance price.

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Findings: Sensitivities

New York

- No additional retirements in high emissions, federal/Canada or very high emissions case (includes failure to meet RPS).
- Impact of program on energy prices under different scenarios is directly related to allowance price level – a measure of costs and a potential effect on revenues.

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Evolution of offset markets with final MOU

- MOU sets new threshold for use of international offsets of $10. This creates new “floor” on price for international offsets used in RGGI.
- Currently international offsets trade at EU ETS price of approximately $13 so price that RGGI folks have to pay could be even higher than $10 threshold.

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A Word on Allowance Allocation

- Cost of regulation not necessarily born at point of compliance.
- Compensation is justification for free allocation.
- Experience (and modeling) have shown that firms can profit (have profited) from carbon regulation.
- There is a sound argument for allocating less than 100% of RGGI allowances for free to emitters.

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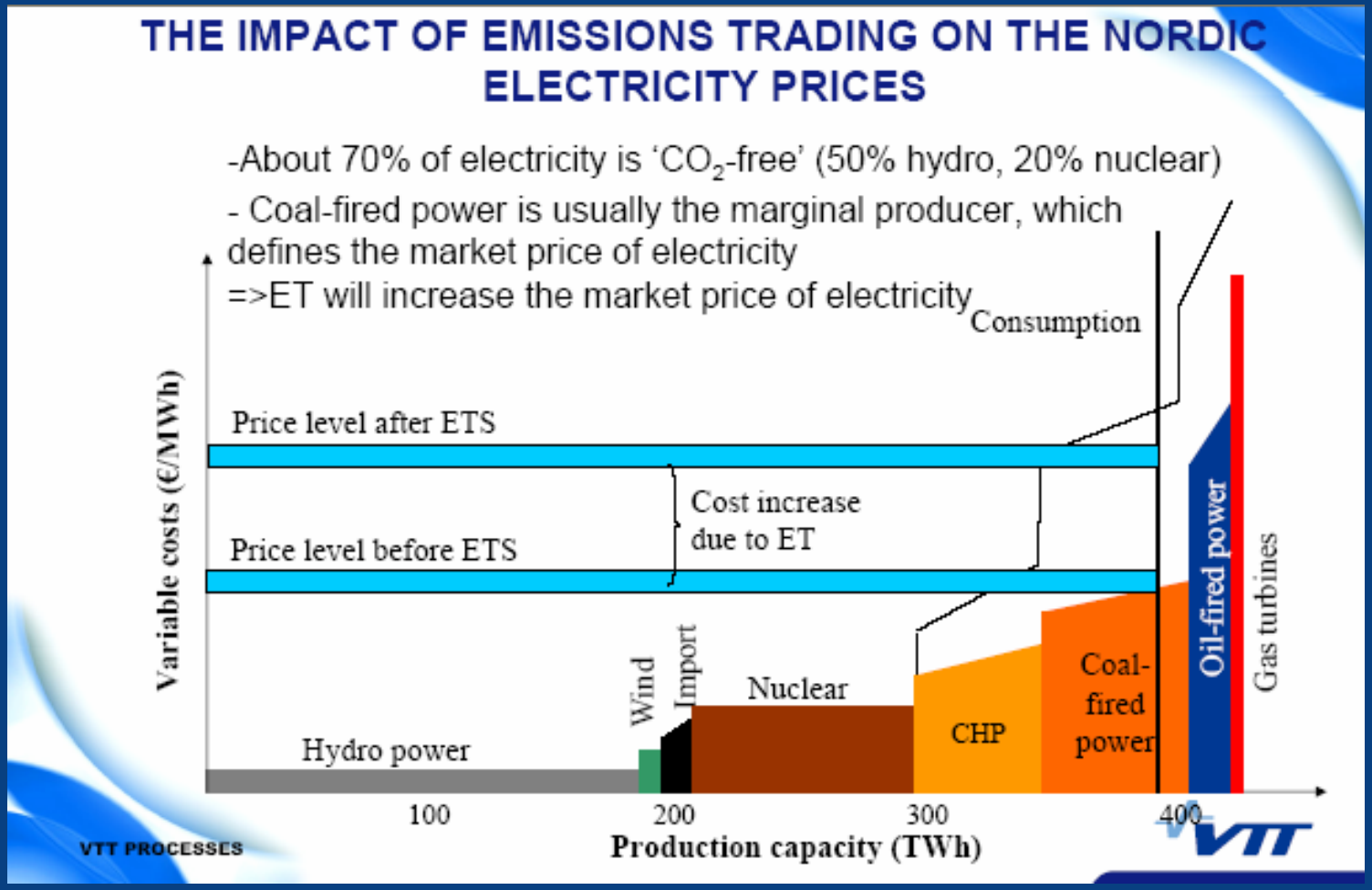

Source: VTT Processes of Finland.

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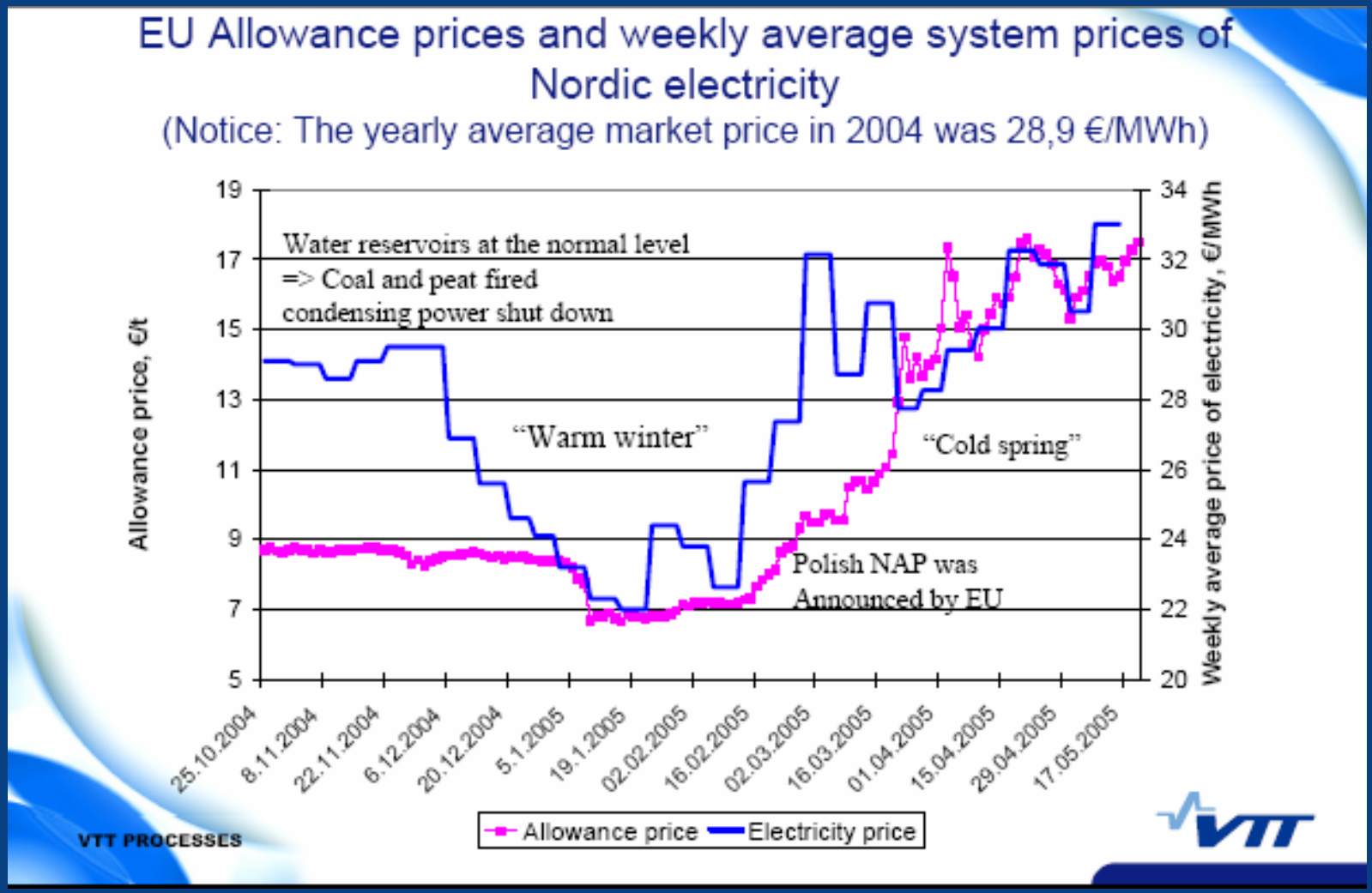

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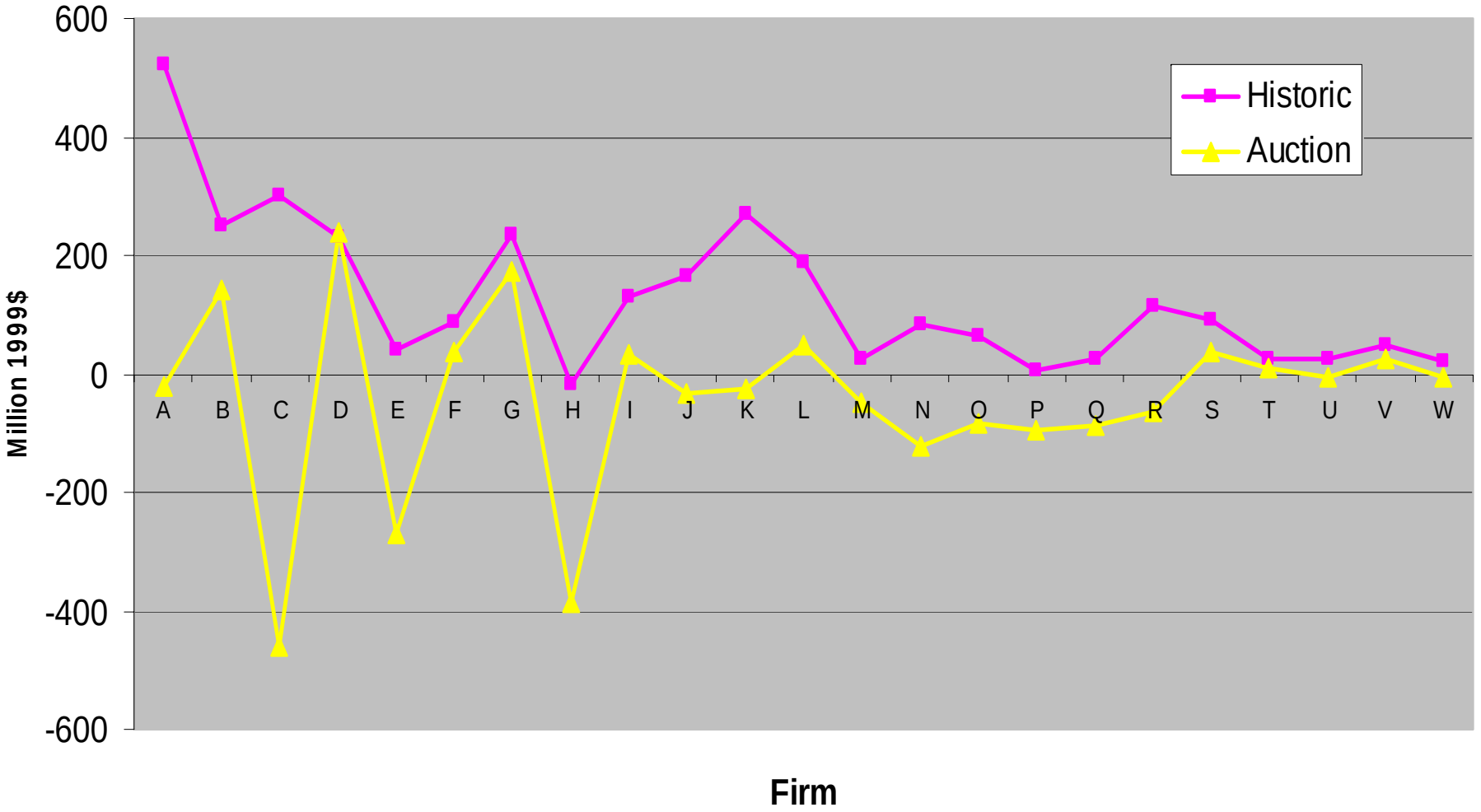
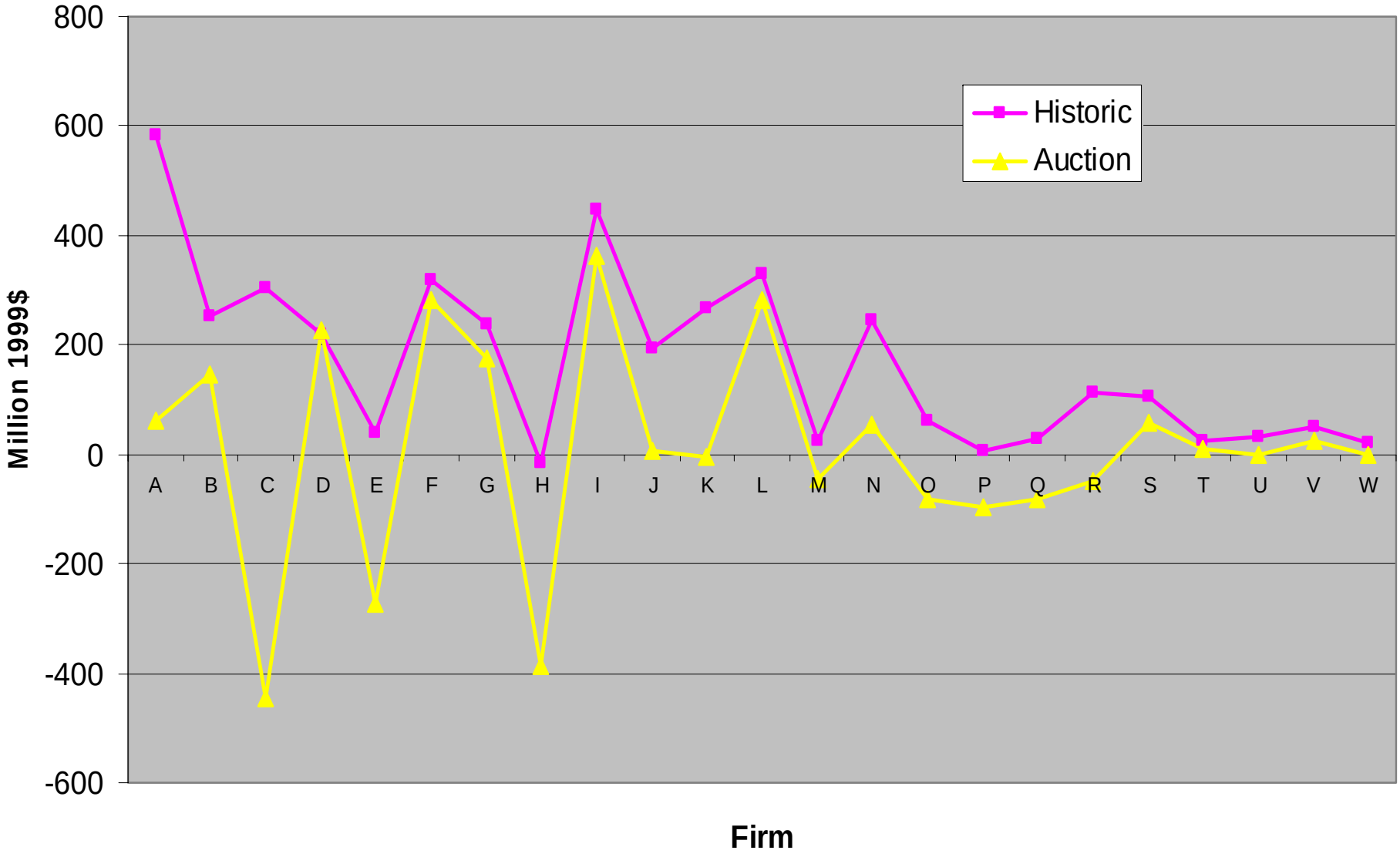
Distribution of the Change in Firm Value within Nine-State RGGI Region for 23 Largest Firms



Change in Firm Value for Four Region Area



Percent of Allowances Needed for Full Compensation of "Losers" in RGGI

	Compensation of Firms that Lose Value	Compensation of Industry
Larger Region (All of MAAC & ECAR included)	**34%**	**< 0%**
9-State RGGI Region Only	**53%**	**29%**

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Chronology of Climate Policy in the Golden State

- June 2005: Gov. Schwarzenegger set goals of achieving 1990 emission levels by 2020 and 80% below that by 2050.
- 2006: PUC procurement standard for new base-load capacity (also in SB1368) = IGCC w CC. Focus is on load serving entities and includes emissions from imports. Cap and trade provisions yet to be developed.
- August 2006: AB 32 is signed; requires CARB to
  - monitor CO_2 emissions
  - develop regulations to reduce CO_2 emissions to 1990 levels by 2020
  - begin emissions cap in 2012
  - Restrictions apply all sectors, not just electricity (trading more narrow).
- October 2006: Gov. Schwarzenegger issues Executive Order S-17-06
  - embraces emissions trading and
  - instructs head of CARB to find ways to link with RGGI and EU ETS.

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Concluding Thoughts

- Modeling provides a useful window on likely effects of RGGI under certain assumptions.
- Sensitivity analyses are important to providing a more complete picture.
- Allowance prices cover a broad range (from close to $1 to close to $12) depending on assumptions. Currently uncertain future offset prices could play important role.
- Capping emissions will raise costs for many facilities, but could also raise profits for many companies depending on mix of technologies and fuels and location of facilities.
- What will happen to address leakage in RGGI?
- The prospect of linking to California raises lots of issues given differences between the two programs.

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